

Abdominal Physical Signs and Medical Eponyms: Physical Examination of Palpation Part I, 1876-1907

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Background: Abdominal palpation is a difficult skill to master in the physical examination. It is through the tactile sensation of touch that abdominal tenderness is detected and expressed through pain. Its findings can be used to detect peritonitis and other acute and subtle abnormalities of the abdomen. Some techniques, recognized as signs or medical eponyms, assist clinicians in detecting disease and differentiating other conditions based on location and response to palpation. Described in this paper are medical eponyms associated with abdominal palpation from the period 1876 to 1907.

Data Sources: PubMed, Medline, on-line Internet word searches, textbooks and references from other source text were used as the data source. PubMed was searched using the Medical Subject Heading (MeSH) of the name of the eponyms and text words associated with the sign.

Conclusion: We present brief historical background information about the physician who reported the sign, original description of the sign, and its clinical application and implication in today's medical practice.

Keywords: Palpation; Abdomen; Signs; Eponyms

Palpation, or the Latin verb *palpates*, meaning to touch, is a tactile sensation and an important but often overlooked part of the physical examination of the abdomen.¹ It is the third skill performed in the systematic sequence of the physical examination preceded by inspection and auscultation and followed lastly by percussion. Auscultation precedes palpation in the abdomen due to concerns related to stimulation of bowel movement, thereby falsely enhancing bowel sounds. Palpation uses the flat flexor surface of the fingers with the forearm maintained in a strict horizontal position, feeling for abnormalities in the abdomen such as tenderness, consistency, induration, and detecting depth and fixation of organs, hematomas, and abscesses.²

Using the dorsum of the hand, palpation is able to detect changes in skin temperature and texture; it is performed using both superficial and deep techniques.

Superficial palpation focuses on detecting abnormalities within the abdominal wall, feeling for crepitation, masses, spasms or eliciting tenderness.³ Superficial palpation for detecting spasm of the recti muscle is identified using a two-hand technique whereby the flexor surface of the fingers of the left hand are in contact with the muscle and depressed with the right hand. Deep palpation using the flexor surface of the fingers with the hand tilted at a slight angle is particularly useful for detecting and evaluating a mass and is performed

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using a one hand or two hand technique. To localize an area of tenderness, gentle systematic palpation of the abdomen using the index finger is employed.⁴ This paper describes medical eponyms associated with palpation of the abdomen. Presented are brief historical aspects, performance, clinical application, and implication of these signs. The signs are presented systematically based on the year they were originally described.

Data Sources

PubMed, Medline, online Internet word searches, and bibliographies from source text and textbooks were used. PubMed was searched using the Medical Subject Heading (MeSH) of the name of the eponyms and text words associated with the sign.

Rosenbach Sign

Ottomar Ernst Felix Rosenbach (1851-1907) was born in Krapkowice, Schlesien Prussian County in Silesia, completed his medical studies in Breslau and Berlin, and received his medical degree in Breslau in 1874.⁵ He was an assistant from 1874 to 1887 at the University Hospital in Jenna in the medical hospital and dispensary. He served as head physician at Breslauer Allerheiligen Hospital from 1887 until 1893 and moved his medical practice to Berlin in 1896, further allowing him to pursue his research interests and scientific work.^{5,6} Rosenbach published 278 books, monographs, treatises, and papers, and among his many accomplishments, he was first to recognize functional disease of the stomach. He authored the book *Über musikalische Herzgeräusche-Nebst Bemerkungen über die Entstehung pseudokardialer Geräusche (About Musical Heart Noises-Along with Remarks on the Origin of Pseudo-Cardiac Noises)* describing the pathophysiology of heart murmurs based on his clinical experience, postmortem investigation, and experimental research.⁷ Using these skills, he developed the first animal model for endocarditis in 1887 and was the first, along with Karl Koester, to recognize the relationship that abnormalities of the cardiac valves predispose to the development of this disease.⁸ He also described the findings of vocal cord paralysis after partial or complete paralysis of the recurrent laryngeal nerve.⁹ A Rose, MD (1907) described him as one whom:

(...) always considered it one of his principal tasks to support the unification of the medical practice as opposed to the ever-increasing division into special branches, thus favoring the idea of allotting to the general practitioner the entire domain of medicine.¹⁰ (p. 859)

As a tribute to Dr. Rosenbach, A Rose, MD (1907) wrote:

[a]ll will agree that among the prominent men of our profession and our time, Rosenbach was, more than any other, an original thinker, observer and investigator, who made no concessions to the extravagant fashions in medicine of the present day.¹¹ (p. 367)

Rosenbach (1876) (Table 1) described his finding when stroking the skin of the abdominal wall in a patient with cerebral hemiplegia as *"If the method described is applied to hemiplegia of cerebral origin, there is no such abdominal reflex on the paralyzed side as I would call the phenomenon, while on the healthy side it remains unchanged and prompt."*¹² (p. 846; emphasis added)

We are unaware of any study that evaluated the sensitivity or specificity of this sign.

McBurney Sign

Dr. Charles Heber McBurney (1845-1913) was born in Roxbury, Massachusetts, graduated from Harvard University in 1866, and received his MD degree from the College of Physicians and Surgeons at Columbia University, New York in 1870.^{13,14} After completing an internship at Bellevue Hospital in New York City, he traveled to Vienna, Paris and London for additional medical training.¹⁴ In 1873, he returned to the College of Physicians and Surgeons serving as Assistant Demonstrator in Anatomy.⁹ In 1880, he was appointed assistant surgeon in Bellevue and in 1888, surgeon-in-chief at Roosevelt Hospital, New York City.⁹ He was Professor of Surgery at the College of Physicians and Surgeons from 1889 to 1894.¹⁴ He described the sign that bears his name at the New York Surgical Society in 1889, soon after Dr. Reginald Fitz reported the pathologic finding of the vermiform appendix at the Association of American Physicians first meeting in 1886, naming the condition appendicitis.¹⁴ McBurney also described the incision for appendectomy that became known as the McBurney incision, which involved splitting rather than cutting the muscle bundles of the external and internal oblique, aponeurosis, and transversalis muscles to access the appendicitis in patients with acute, non-perforated appendicial disease.¹⁵

In his 1889 paper, "Experience with Early Operative Interference in Cases of Disease of the Vermiform Appendix," Dr. McBurney reported:

*The seat of greatest pain, determined by the pressure of one finger, has been very exact between an inch and half and two inches from the anterior spinous process of the ilium on a straight line drawn from that process to the umbilicus.*¹⁶ (p. 678; emphasis added) (Table 1)

It is of historic interest that Ludwig Taube described in 1871 a case in "Entzündung des Bindegewebes und des Peritonäum in der Umgegend des Coecum mit Fäcal-Obstruction des Colon" (Inflammation of Connective Tissue and Peritoneum in the Area of the Cecum with Fecal Obstruction of the Colon) of a previously healthy man, aged 32 years:

It began with a body-pain, which at first appeared in the lower half of the abdomen, between the middle of the anterior superior spine and navel, at first moderately, but already reaching a great severity later, and continuing to increase in intensity by late noon yesterday.¹⁷ (p. 55)

Two days later he wrote, "Abdomen is very much distended, tense, and sensitive everywhere to pressure, to the right more strongly, to the point mentioned above between iliac spine and

Table 1. Summary of Abdominal Physical Signs of Palpation from 1876 to 1907.

Sign	Year	Description	Sensitivity	Specificity
Rosenbach	1876	In cerebral hemiplegia, absence of the abdominal wall skin reflex when stroking the skin of the abdomen on the paralyzed side.	Unknown	Unknown
McBurney	1889	Pain on abdominal palpation caused by applying pressure of one finger located between an 1 ½" and 2 ½" based on a straight line drawn from the anterior spinous process of the ilium (ASIS) to the umbilicus.	83%	45%
Courvoisier	1890	The absence of gallbladder dilation caused by a gallstone and its presence as due to other causes of obstruction (eg, malignancy).	26%-55% (for malignancy)	83%-90% (for malignancy)
Boas	1890	Pressure point tenderness located at the 12th thoracic vertebra extending to a region 2 or 3 finger-breadths distant from the vertebral bodies; spreading from this point to the right, and in some case to the posterior axillary line.	7%	Unknown
Murphy	1903	(1) Pain on deep palpation located just below the right 9th costal cartilage or at a point located at the junction of a vertical line drawn from the middle of the inguinal ligament to the 9th costal cartilage. (2) Pain on deep percussion at the junction of the same line with the patient in forced inspiration. (3) The inability of the patient to take a full, deep inspiration when the examiners fingers are hooked up beneath the right costal arch below the liver margin.	48%-97%	48%-96%
Krymov	1906	Tenderness of the right inguinal canal on introduction of a finger through the external opening in the area of the posterior abdominal wall.	Unknown	Unknown
Berthomier-Michelson	1906	In chronic appendicitis, pain worsening when pressure is applied in the cecal-appendicular region with the patient in the left lateral decubitus position.	Unknown	Unknown
Rovsing	1907	Pressing the right hand with the fingers of the flattened left hand against the colon and compressing the same hand upwards against the left flexure results in pain at McBurney's point (right iliac fossa).	19%-75%	58%-93%

navel."^{17(p. 56)} The sign is believed to be caused by reflex irritation of the 11th and 12th dorsal thoracic segments nerve endings on the anterior abdominal wall by the inflamed appendix.¹⁴ These nerve segments are affected regardless of movement of the inflamed appendix from its typical location.¹⁴ **Soda et al¹⁸ reported a sensitivity and specificity of McBurney sign in the initial clinical examination in appendicitis of 83% and 45%, respectively, with a positive and negative predictive values of 76% and 56%, respectively.** A meta-analysis found a positive and negative likelihood ratio of direct tenderness with McBurney sign for the diagnosis of appendicitis of 1.29 (1.06-1.57) and 0.25 (0.12-0.53), respectively.¹⁹ These findings suggest that McBurney point tenderness is not useful in the diagnosis of acute appendicitis. Results from these studies should, however, be carefully considered based on their clinical context. The most common physical finding in patients with

acute appendicitis is local tenderness, which in some cases may be masked by more generalized pain that has not yet localized. The point of maximum tenderness at McBurney's point is believed to be fixed and, thus, represents not the position of the appendix, but the site on the anterior abdominal wall where the the dorsal segments of the 11th and 12th nerves are irritated by parietal peritoneal appendicial inflammation. This finding may be absent in patients with a thick abdominal wall or omental fat or whose appendix is located retroceally in the pelvis or in the fossa on the posterior abdominal wall.²⁰ It should be recognized that the point of maximal tenderness may be localized at sites in the right iliac fossa other than McBurney's point, as described by Cope, Lanz, Clado, and Gray.²⁰ However, as stated by Boyce:

[t]here are decided differences of opinion concerning the value of most of them. (...) Appendicitis may be present even if the maximum tenderness is not exactly localized, but as a general rule, if McBurney's point of tenderness can be

demonstrated, one is reasonably safe in excluding every other disease.²⁰ (p. 139)

Thus, even today surgeons routinely search for this physical sign in patients presenting with acute or subacute abdominal pain. Furthermore, it is recognized that the diagnosis of acute appendicitis requires a high index of clinical suspicion due to the myriad presentation of this disease.

Courvoisier Sign

Ludwig Georg Courvoisier (1843-1918) was born in Basel, Switzerland,²¹ received his medical degree from Basel in 1868 and, in 1900, was appointed Professor of Surgery at the University of Basel.^{9,21,22} Courvoisier served in a military hospital in Karlsruhe during the Franco-Prussian war of 1870 and was appointed to the surgical staff at Riehen and Professor of Surgery at the University of Basel in 1899.²² He was the first surgeon to successfully perform a choledocholithotomy and further advance cholecystectomy procedures as described in his book on biliary surgery, *Casuistisch-statistische Beiträge zur Pathologie und Chirurgie der Gallenwege* (Statistical Contributions to the Pathology and Surgery of the Biliary Tract).²³

He described the appearance of the gallbladder due to gallstones and other causes of biliary obstruction in his aforementioned textbook in 1890, when he wrote:

*It is usually stated in the manuals and textbooks that stone obstruction of the choledochus leads to enlargement of the gallbladder by biliary obstruction. I do not find this to be true, and must consider the absence of dilation of the gallbladder due to a gallstone and the presence of gallbladder dilation due to other causes of obstruction. If this were to be confirmed further, this would be an important point of reference for the differential diagnostics!*²³

(p. 58) (emphasis added) (Table 1)

The sign has been described in a number of conditions including cholelithiasis, choledocholithiasis, Hartmann's pouch obstruction, chronic autoimmune pancreatitis, parasitic obstruction of the biliary system, and congenital choledochal cysts.²⁴ The underlying pathophysiology, as explained by Courvoisier, is interpreted as follows:

According to the earlier account, the stones in the common bile duct originate from the gallbladder. On their way, however, as they have been shown, the stones as they pass irritate the cystic duct as well as the gallbladder and this irritation causes chronic inflammation of the gallbladder wall, which often leads to a shrinking of the duct and gallbladder. If the gallbladder is altered, the strongest biliary stasis will no longer be able to expand it. In most other cases of obstruction, especially those due to tumor, bile flow shows a normal compliant gallbladder!²³ (p. 58)

Chung et al²⁵ assessed the pliability and gallbladder size in patients with chronic calculus cholecystitis with or without common duct obstruction, in periampullary malignancy, and in those with a normal gallbladder, and showed a significant

increase in ductal pressures in the dilated gallbladder with pliability equivalent in all the groups. Chronically increased ductal pressures are vital to the gallbladder dilation, and chronic elevations are more prevalent in progressive malignant biliary obstruction compared to intermittent gallstone obstructions.²⁵ Murphy et al,²⁶ in a study of 394 magnetic resonance cholangiopancreatography scans, identified a greater gallbladder volume in patients with obstructive causes of biliary disease.

Although Courvoisier's sign has been described in contemporary medicine in reference to a palpable distended gallbladder in jaundiced patients due to malignancy, it can be found in other causes of biliary obstruction, and thus, its significance should be considered a sign rather than a law. Furthermore, the absence of this sign does not exclude malignant causes of biliary obstruction. **A distended, palpable, nontender gallbladder in a jaundiced patient (Courvoisier's sign) is 83% to 90% specific with a sensitivity of only 26% to 55% for malignant obstruction of the bile duct.**²⁷

Boas Sign

Ismar Isidor Boas (1858-1938) was born in Kcynia, Poland (Exin, Pocen province),²⁸ received his medical training and degree from the University of Halle, continued his training at the University of Leipzig, and returned to the University of Halle to complete a doctorate in 1881. He worked with Carl Anton Ewald at the Augusta Hospital in Berlin, and he was the first to receive a gastrointestinal specialist license, opening a clinic for digestive diseases in Berlin in 1886. He made extensive contributions to the field of gastroenterology such as the description of *Lactobacillus acidophilus*, also known as "Boas-Oppler bacillus." Along with Carl Anton Ewald, he developed the test meal used to measure gastric secretion. He was the first to recognize occult blood for the early diagnosis of gastric carcinoma.^{29,30}

Boas founded the first gastroenterology journal in Germany, *Archiv für Verdauungs-Krankheiten mit Einschluss der Stoffwechselfathologie und Diätetik* (Archives for Digestive Disease with Inclusion of Metabolic Pathology and Dietetics), in 1896^{28,31} and was one of the founding members of the Society of Digestive Disease in Germany in 1914.

In Boas' 1890 textbook, *Diseases of the Stomach*, translated from German to English in 1907, he wrote:

The pressure-points on the spine to which I first called attention are of no little diagnostic importance. Of these we may distinguish 1. Pressure-points, or better, areas in the gastric ulcer. 2. In cholithiasis. 3. In gastric neuroses. In gastric ulcer, in which they are present at least in one-third of the cases, they are located to the left of the spine, close to the body of the twelfth dorsal vertebra. This position may vary, however, which is not to be wondered at, considering the changes in the location of the stomach and of the ulcer; thus the painful area may be higher, at about the tenth or eleventh dorsal vertebra, or lower, as far down as the first

lumbar vertebra. Sometimes a corresponding tenderness is situated to the right side, yet in that case the left one is the more sensitive; occasionally the point is located only in the right side, close to the vertebral body. This is particularly true when the ulcer is located at the pylorus or in the duodenum.³² (pp. 79-81)

In reference to gallstones he wrote:

*The point of tenderness on pressure in cholithiasis, which we discuss here because of the frequent consideration of the differential diagnosis between diseases of the stomach and gall-bladder, is likewise located in the region of the twelfth dorsal vertebra, but at a point two or three finger-breadths distant from the vertebral bodies. It spreads from this point to the right, and in some cases as far as the posterior axillary line; it extends, therefore, over the whole posterior surface of the liver.*³² (p. 81) (emphasis added) (Table 1)

The terms Boas point and sign have been used interchangeably in the literature. Boas point has been used to describe increased cutaneous sensitivity to the left of the 12th thoracic vertebrae. Other sources used Boas sign in reference to increased sensitivity to light touch in the right infrascapular area or even in the right upper quadrant,³³ a departure from Boas' original description. It is considered a sign for acute cholecystitis. There has been only one study that reported the presence of increased sensitivity or hyperesthesia in the above-mentioned areas in 7% of patients undergoing cholecystectomy.³⁴ There have been no studies that have validated the original sign as described by Boas.

Murphy Sign

Sir John Benjamin Murphy (1857-1916) was born in Appleton, Wisconsin, received his medical degree from Rush Medical College in 1879, and interned at Cook County Hospital in Chicago.³⁵ Thereafter, beginning in 1882, he travelled to Vienna, Berlin, Heidelberg, Munich, and London advancing his medical training. He served as professor of clinical surgery in the College of Physicians and Surgeons of Chicago from 1892 to 1901. He was Professor of Surgery at Northwestern University from 1901 to 1905 and 1908 to 1916 and at Rush Medical College from 1905 to 1908.³⁵ He was also Professor of Surgery in the Post-Graduate Medical School of Chicago and the Chicago Clinical School.³⁵ He served as Chief of Surgery at Mercy Hospital in Chicago from 1895 to 1916.³⁵ He was president of the Chicago Medical Society from 1904 to 1905, president of the American Medical Association from 1911 to 1912, president of the Clinical Congress of Surgeons of North America, and a member of the Board of Regents of the American Surgical Association beginning in 1913.³⁵ He practiced evidence-based medicine in that era, designing a technique for end-to-end intestinal anastomosis.

He received numerous awards, degrees, and titles for his accomplishments including Laetare Medal by Notre Dame University in 1902 and Knight Commander of the Order of

Saint Gregory the Great by Pope Benedict XV in 1916.³⁵ Other eponyms named after Dr. Murphy included Murphy's punch, Murphy's test, Murphy button, and Murphy-Lane bone skid. William J. Mayo (1922) wrote about Murphy:

In reviewing Dr. Murphy's manifold activities and attempting to determine the greatest of his many great qualities, I think we may place first his ability as a teacher of clinical surgery and sum up by saying that in this respect he was without a peer. In his talented and discriminating writing we find evidence of his teaching on every hand. Dr. Murphy was the surgical genius of our generation.³⁵ (p. 166)

He thus had extensive expertise in vast areas including general surgery, orthopedics, neurosurgery, and cardiothoracic surgery.

In his paper "The diagnosis of Gall-Stones," Murphy (1903) described the technique for examination of a patient to differentiate hypersensitivity of the gallbladder or acute cholecystitis caused by infection and gallstone obstruction from cancer and other conditions:

*Hypersensitiveness is elicited by deep palpation just below the right ninth costal cartilage, or in a line from that point to the middle of Poupart's ligament, as this is the common track of gall-bladder enlargement. Deep percussion along the same line, with patient in forced inspiration gives pronounced pain. The most characteristic and constant sign of gall-bladder hypersensitiveness is the inability of the patient to take a full, deep inspiration, when the physician's fingers are hooked up beneath the right costal arch below the hepatic margin. The diaphragm forces the liver down until the sensitive gall-bladder reaches the examining fingers, when the inspiration suddenly ceases as though it had been shut off.*³⁶ (pp. 827-828) (emphasis added) (Table 1)

It is noteworthy that Murphy initially described a hooking technique rather than an anterior subcostal approach to detect gallbladder hypersensitivity. In an April 26, 1910 presentation on "Gallstone Disease and its Relation to Intestinal Obstruction" at the Chicago Medical Society, he also described a perpendicular percussion technique for evaluation of the gallbladder in which the "left hand elevated with the middle flexed perpendicularly at the tip of the ninth costal cartilage. (...) the finger struck with the right hand when the patient is in deep inspiration. This causes great pain if the gall-bladder is distended or inflamed."³⁷ (p. 278)

Singer et al³⁸ retrospectively studied 100 consecutive patients who underwent hepatobiliary scintigraphy and reported a sensitivity and specificity of Murphy's sign of 97% and 48%, respectively, and a negative predictive value of 93%. Jain et al³⁹ reported a sensitivity and specificity of 62% and 96%, respectively, for a positive Murphy's sign. The positive and negative likelihood ratios were 1.6% and 0.4%, respectively. Older studies reported sensitivity ranging from 48% to 97% and specificity of 48% to 79% with positive and negative likelihood ratios of 1.9% and 0.6%, respectively.^{38,40,41} The finding of right upper quadrant pain and suspected cholecystitis in patients with positive Murphy's sign suggests the possible

presence of cholecystitis. Studies have shown that Murphy's sign is often not detectable in the older population, with a sensitivity and specificity of 48% and 79%, respectively, having been identified in patients 70 years of age and older.⁴⁰ A study by Trowbridge et al⁴² reported a sensitivity of 65%, specificity of 87%, and positive likelihood ratio of 2.8 (95% CI, 0.8-8.6) with a 95% confidence interval (CI) included 1.0. **The data reported by different studies showed wide variation in specificity and sensitivity.** Use of this diagnostic test alone results in a high rate of false negative results. Thus, imaging studies should be obtained if there is a moderate to high clinical suspicion of acute cholecystitis despite a negative sign.

Krymov Sign

Alexey Petrovich Krymov (1872-1954) was born in Moscow and received his medical degree from the Medical Faculty Moscow University in 1898.^{43,44} During the last year of his medical training he received a gold medal for his work *Stones of Kidneys and Their Surgical Treatment*. In 1911, he completed *The Doctrine of the Hernia*, one of the most comprehensive studies of this subject in the literature.^{43,44} In 1912, he was assistant professor at Kiev University serving as the head of Hospital Surgery,⁴⁵ and in 1913, he was elected head of the Department of Hospital Surgery of the Medical Faculty at Kiev University.^{43,44} In 1919, he was elected chairman of the Physical-Medical Society and in 1928 head of the Kiev Surgical Society. He also served as a member of the Presidium of the Academic Council of the Ministry of Health of the Ukrainian SSR.^{43,44} In 1930, Krymov was elected head of the Department of Surgery at Kiev Medical Institute and in 1948 was chairman of the Congresses of the Surgeons of USSR.⁴⁶ He published 135 manuscript including 10 monographs.^{43,44} He was also chairman of the Physic-Medical Society, the Ukrainian Scientific Surgical Society, and Surgical Society in Kiev. He was awarded the Order of Lenin, the Red Banner of Labour, the Red Star, and a medal for "Valiant Labour in the Great Patriotic War."^{43,44}

*The sign refers to the presence of tenderness of the right inguinal canal on introduction of a finger through the external opening in the area of the posterior wall in patients with acute appendicitis.*⁴⁷ (emphasis added) (Table 1) The symptom occurs at the point where the transversalis fascia that joins the parietal peritoneum and, thus, signifies the presence of peritoneal inflammation. We were unable to identify the original paper by Krymov and believe that it may have been written as a dissertation or monograph.⁴⁸ **We are unaware of any studies that have evaluated the sensitivity or specificity of this sign.**

Berthomier-Michelson Sign

André-August Berthomier (1848-1914) was born in Allier, Langy, France. He served as an intern in the Hospital in Lyons from 1842 to 1846 and in the department of surgery in 1878 in Moulin. In 1898, he served as Chief of Surgery followed by honorary surgeon. His son, named André Berthomier, was also

a physician and wrote his thesis *Les Cournats de Haute Fréquence dans les Dermatoses-dites autrefois-Diathésiques: Prurit, Eczéma, Psoriasis, Acné* (High Frequency Currents in Dermatoses -formerly called- Diathetic: Pruritus, Eczema, Psoriasis, Acne) in 1906. André-August Berthomier received the Légion d'honneur (Chevalier) on July 11, 1908 at the Paris School of Medicine.

Dr. André-August Berthomier presented his sign at the 19th French Congress of Surgery in 1906 in a communication titled *De l'examen dans le décubitus latéral gauche pour le diagnostique difficile de l'appendicite* (On the examination of left lateral decubitus for the difficult diagnosis of appendicitis).⁴⁹ He described a symptom found in 119 cases that he believed to be pathognomonic of chronic appendicitis:

*This symptom consists of the very marked difference which exists between the intensity of the pain caused by the pressure on the caeco-appendicular region according to whether the patient is in the supine or in the left lateral decubitus. This characteristic difference is often the only symptom to recognize chronic appendix. Several times I have found that the exploration of McBurney point, in the supine position, did not leave any suspicion of the existence of an old condition of the appendix, while the exploration in the lateral decubitus left gave very precise indications.*⁴⁹ (p. 167) (emphasis added) (Table 1)

He further stated "To conclude, I will say, therefore, that the exaggeration of the pain provoked in the left lateral decubitus at the point of McBurney is a definite sign of old adhesions of chronic caeco-appendiculaire-appendicitis."⁴⁹ (p. 169) He reported his findings with the use of this maneuver:

I also studied the same symptom in 57 cases of right salpingectomy, either alone or followed by subtotal hysterectomy. Exploration had given absolutely opposite results: acute pain during exploration in the supine position, pain that was absent or much less pronounced in the left lateral decubitus. In none of these cases have I seen lesions of the appendix or cecum. In ten other cases, where the bimanual touch indicated obvious straight salpingitis, the pressure in the left lateral decubitus had given an overt exaggeration of the pain. Now, in these cases, the appendix has been found adherent to the trunk and ovary.⁴⁹ (p. 169)

Berthomier considered the other causes in which the sign may be positive:

In another condition in which the examination in the left lateral decubitus causes an exaggeration of the pain in the right flank, an index of old adhesions, I want to speak about is old tubercular peritonitis which healed spontaneously. But in these cases, the pain is also acute, often even more marked at the right angle of the ascending colon.⁴⁹ (p. 169)

Thus, examination of the appendix in right iliac fossa, with the patient in the left lateral decubitus position, also increases the probability for detecting chronic appendicitis with adhesions caused by tuberculosis.

It is proposed that when the patient lies on his/her left side, the omentum and intestine are displaced to the left enhancing the accessibility of the appendix to palpation. This sign has been referred to as the Berthomier-Michelson sign. There is a manuscript published by Dr. FG Michelson, "Zur Frage von der primären chronischen Appendizitis und ihrer differentiellen Diagnose" (On the question of primary chronic appendicitis and its differential diagnosis), but this paper postdates Berthomier description in 1906.⁵⁰

Rovsing Sign

Niels Thorkild Rovsing (1862-1927), a Danish surgeon, was born in Flensburg, Germany, received his MD degree from the University of Copenhagen in 1885, and was appointed Professor of Operative Surgery in 1899 and Senior Surgeon at the Fredericks Hospital in 1904.^{51,52} Rovsing was one of the founders of the Danish Surgical Society in 1908 along with Eilert A. Tscherning. He was a honorary member of the Edinburgh Medico-Chirurgical Society and of the Association of Surgeons of Great Britain and Ireland.^{51,52} His research interest included cystitis and tuberculosis of the urinary tract as well as the gallbladder and gallstones.⁵²

In his 1907 paper entitled "Indirektes Hervorrufen des typischen Schmerzes an McBurney's Punkt. Ein Beitrag zur Diagnostik der Appendicitis und Typhlitis" (Indirect evoking of typical pain at McBurney's point. A contribution to the diagnosis of appendicitis and typhilitis), Rovsing described the method for eliciting the sign as follows:

*[t]he thought occurred to me whether I could not cause the typical pain in the left iliac fossa on the descending colon by pressing my right hand with the fingers of the flattened left hand against the colon, and in this way compressing the same hand upwards against the left flexure.*⁵³ (p. 1258) (emphasis added)

(Table 1)

Clinicians often inaccurately performed this test in clinical practice by only applying pressure in the left lower quadrant.^{54,55} It has been described as a way of testing for rebound tenderness by applying pressure in the left lower quadrant and then quickly releasing the hand.⁵⁶ There have been several theories to account for the pathogenesis of Rovsing sign. Rovsing proposed:

It was my thought, that the increased pressure and the tension of the intestinal gases of the central part of the colon, that the pain in McBurney's point arose from the experience of strictures in the rectum, and especially of the sigmoid. According to which the cause of the cecum and other structures are particularly strongly influenced by the elevated pressures, simply because he first encounters an effective area; which the Valvula Bauhinii (ileocec valve) prevents the passage of the intestinal contents into the small intestine. In the wall of the cecum there is only the fine opening to the appendix, through which the intestinal air can be pressed. It seemed to me, that in the case of appendicitis or inflammation of the cecum, an increase of the intestinal tension by compression of the intestine would cause pain

just at the inflammatory point. However, I was not expecting this to be such a fine, safe, and valuable diagnostic tool as has been shown in more than 100 cases.⁵³ (p. 1258)

Thus, the maneuver generates antiperistaltic movement causing elevated tension due to the accumulation of intestinal gases in the colon, and early sufficient resistance at the ileocecal valve results in pain in the right lower quadrant.⁵⁵ Other theories include impingement of the inflamed appendix in the right iliac fossa as a result of rightward movement in the coils of ileum,⁵⁴ or apposition and friction of the inflamed appendix caused by pressure and shifting against the parietal peritoneum.⁵⁵ Rovsing goes on to explain the significance of the test in the differential diagnosis:

It is of great importance in the case of differential diagnosis, in the many cases of acute as well as chronic appendicitis, where intumescence and pain in the right fossa iliac are of unsafe nature, and are characterized by renal pains, ureteral stones, ureteritis, or salpingitis, etc. as well as by an appendicitis can be ruled for only if the pain can arise from a disease of the appendix or the cecum.⁵³ (p. 1259)

The predictive power of Rovsing sign is based on positive likelihood ratios ranging from 1.5 to 4.23, which argues that this sign may be useful in diagnosing acute appendicitis. **The sensitivity of Rovsing sign in various studies ranges from 19% to 75% with a specificity of 58% to 93%.**⁵⁵ The wide variability in sensitivity and specificity found in studies is believed to be attributed to inconsistent methodology used to elicit the sign.⁵⁵

Conclusion

As we have learned, these techniques and skills were important to physicians prior to the advent of technology such as radiographs and other advanced imaging techniques. The palpatory examination of the abdomen requires a meticulous and systematic approach and must include the abdominal wall and deeper intra-abdominal structures. These signs represent the ingenious and innovative methods for detecting disease of the abdomen using the fine skills of touch. The value of these signs depends on the skill set of the clinician. We believe that it is important that these signs continue to be taught during medical school and residency training. Rosenbach, McBurney, Murphy, and Curvoisier signs maintain a high degree of accuracy among expert clinicians, and their presence should be confirmed by appropriate laboratory and radiographic studies.

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